Arboricultural Impact Assessment

BE1134.1b
Barnsley Fire Station, Broadway, Barnsley, S70 6QZ

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Grid reference	SE 33204 05634
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Client	Turner & Townsend Project Management
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Executive Summary

Bagshaw Ecology Ltd have been instructed by Turner & Townsend Project Management to undertake an Arboricultural Impact Assessment of the land at Barnsley Fire Station, Broadway, Barnsley, S70 6QZ in relation to an application for planning.

The development proposals are to demolish the existing building, and construct a new fire station at the site.

The site survey identified a total of six trees and one group of trees with the potential to be affected by the development proposals.

The trees on the site include two Category B trees of moderate-quality, and four Category C trees and one group of low-quality.

According to the website of Barnsley Metropolitan Borough Council (2019), none of the trees at the site are subject to Tree Preservation Orders (TPOs), nor are they located within the boundaries of a Conservation Area.

In order to make the development proposals feasible, four Category C trees will necessitate removal from the site.

To ensure the successful retention of one Category B tree, cellular confinement should be installed in in all areas where a proposed pedestrian walkway passes over the RPA.

It is recommended that the **Arboricultural Method Statement** - provided in **Appendix 4** - is followed throughout construction works. This includes further details regarding tree removals, along with specifications for ground protection and cellular confinement.

Although the proposed removals are anticipated to have minimal impact upon the amenity of the surrounding area, it is recommended that four trees should be included within a post-development mitigation planting scheme.

1. Introduction

1.1. Background

Bagshaw Ecology Ltd have been instructed by Turner & Townsend Project Management to undertake an Arboricultural Impact Assessment of the land at Barnsley Fire Station, Broadway, Barnsley, S70 6QZ in relation to an application for planning.

The purpose of the report is to:

- Assess the quality of the trees on and immediately adjacent to the site, in accordance with BS5837: 2012 – Trees in Relation to Design, Demolition and Construction: Recommendations (hereafter referred to as BS5837: 2012).
- Identify trees suitable for retention and for removal due to the proposed development.
- Prescribe tree protection measures to ensure that retained trees survive the proposed development and thrive after its completion.
- Prescribe arboricultural recommendations for the long-term management of trees on the site.
- To assess the site for its suitability for mitigation planting, and to specify planting requirements.

1.2. Site Details

The site is located at OS grid reference SE 33204 05634 and is accessed north off Broadway. The site is bound by Broadway to the south, a public right of way to the east, commercial property to the north-west, and by scrubland to the north-east.

The site is approximately 0.8 ha in size, and is currently comprises the existing fire station, various auxiliary buildings, and staff/visitor parking facilities.

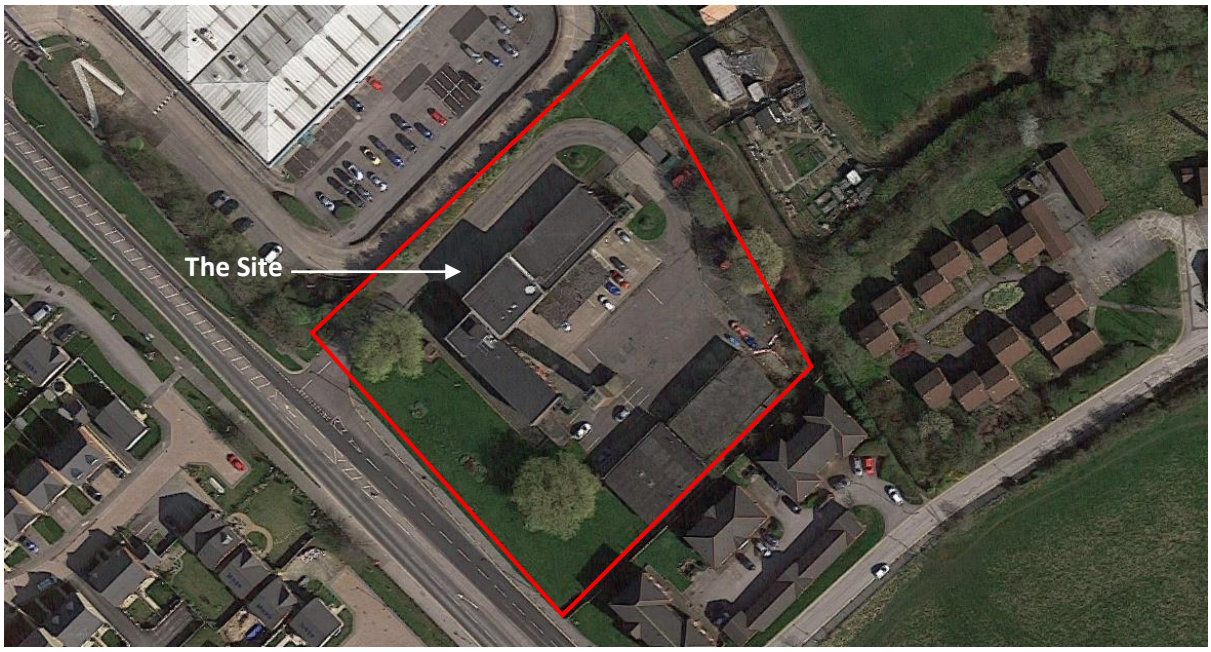


Figure 1: Aerial imagery showing approximate boundary of the site (Google Earth Pro, 2019)

1.3. Development Proposals

The development proposals are to demolish the existing building, and construct a new fire station at the site.

2. Methods

2.1. Desk Based Study

The local council was consulted to determine if any trees on the site and immediately adjacent to the site are protected by Tree Preservation Orders (TPOs) and/or are within Conservation Areas. Cranfield (2019) was consulted as to the soil type of the surrounding area.

2.2. Site Survey

The site survey was carried out on Monday 9th September 2019. The weather at time of survey was clear and dry; visibility was good.

The survey was carried out by Jack Delaney. Jack Delaney has worked within the arboricultural industry for ten years, holds an FdSc in Arboriculture, and is a professional member of the Arboricultural Association.

All trees on site were inspected from ground level, using the Visual Tree Assessment (VTA) method (Mattheck *et al*, 2015). Any notable defects of trees were recorded, although the site survey did not constitute a full tree safety assessment.

Tree heights and crown clearances were measured to the nearest 0.5m with a clinometer. Crown spreads of trees were measured on their, north, east, south and west aspects to the nearest 0.5m.

The diameter at breast height (DBH) of trees was measured to the nearest 10mm. This was used to calculate the root protection area (RPA) of trees using methods prescribed in BS5837: 2012:

- For single stem trees, the RPA was calculated as a circle with a radius 12 times the DBH.
- For trees with 2-5 stems, the RPA was calculated using the formula:

  $$\text{RPA} = \sqrt{(\textbf{Stem 1 DBH})^2 + (\textbf{ Stem 2 DBH})^2 + \dots (\textbf{Stem 5 DBH})^2}$$

- For trees with 6 or more stems, the RPA was calculated using the formula:

  $$\text{RPA} = \sqrt{(\mu\, \boldsymbol{DBH})^2 \textbf{ x number of stems}}$$

In accordance with BS5837: 2012, trees were classified as either A, B, C or U, using the criteria shown in Table 1. Trees are further classified by the subcategories 1, 2 and 3, depending upon whether they have mainly arboricultural qualities, landscape qualities, or cultural values. The additional subcategory does not affect the retention value of the tree, e.g. a Category A2 tree does not have a higher value than a Category A1 tree.

Table 1: BS5837 Cascade Chart (adapted from British Standards, 2012)

Category	Definition	Retention	Colour code
Category A	**Trees of high quality with an estimated remaining life expectancy of at least 40 years; trees that are particularly good examples of their species, especially if rare or unusual.**	**Highly desirable**	**Light green**
Category B	**Trees of moderate quality with an estimated remaining life expectancy of at least 20 years; trees lacking the special quality to merit category A designation.**	**Desirable**	**Dark blue**
Category C	**Trees of low quality with an estimated remaining contribution of at least 10 years, or trees with a stem diameter below 150mm; unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories.**	**Feasible, but should be removed if posing a constraint to development**	**Grey**
Category U	**Trees that have serious, irremediable, structural and/or physiological defects, including those that will become unviable after removal of other category U trees.**	**Unfeasible**	**Dark red**

2.3. Constraints

The survey was constrained by the season in which it took place. Some pathogens of trees, in particular fruiting bodies of decay fungi, are only visible at certain times of year.

3. Results and Assessment

3.1. Desk Based Study

According to the website of Barnsley Metropolitan Borough Council (2019), none of the trees at the site are subject to Tree Preservation Orders (TPOs), nor are they located within the boundaries of a Conservation Area.

Cranfield (2019) states that the surrounding area consists of slowly permeable acid loamy and clayey soils, which are seasonally wet. No further detailed soil analysis was carried out as part of the survey.

3.2. Tree Population Assessment

The site survey identified a total of six trees and one group of trees with the potential to be affected by the development proposals.

The trees on the site include two Category B trees of moderate-quality, and four Category C trees and one group of low-quality.

There were no Category A trees of high-quality or Category U trees with estimated life expectancies of <10 years identified at the site.

Table 2: Summary of Tree Categories

Category	Description	Tree/group numbers	Totals
A	**Trees of high-quality which should where be possible be retained throughout any proposed development**	-	-
B	**Trees of moderate-quality which should where possible be retained throughout any proposed development**	T3, T4	**2 Trees**
C	**Trees of low-quality which should not be considered a constraint to development**	T1, T2, T3, T4 **G1**	4 **Trees** **1 Group**
U	**Trees which should be removed for sound management reasons, regardless of proposals**	-	-
		Total:	**6 Trees** **1 Group**

Tree data can be viewed in **Appendix 1: Tree Survey Schedule**. Images of trees can be viewed in **Appendix 2: Images of Trees.** Tree locations can be viewed in **Appendix 3: Tree Constraints Plan.**

Tree species on and adjacent to the site include sycamore *Acer pseudoplatanus*, cherry laurel *Prunus laurocerasus,* Dogwood *Cornus sanguinea,* orchard apple *Malus domestica*, *Golden weeping willow Salix × sepulcralis 'Chrysocoma',* Cotoneaster *Cotoneaster horizontalis*, laburnum *Laburnum anagyroides* and hawthorn *Crataegus monogyna.*

4. Impact Assessment

4.1. Tree Removals

Prior to works commencing, T1, T2, T5 and T6 will necessitate removal.

T1 and T2 are situated as such, that a proposed back-up generator will be positioned within the RPA of both trees.

T5 and T6 are situated as such, that large proportions of both RPAs would be impacted by the proposed demolition of an existing adjacent building, and by the subsequent application of hardstanding.

T1, T2, T5 and T6 are Category C trees of low-quality, and therefore should not be considered a constraint to the development.

4.2. Root Protection Areas (RPAs) Impacted by the Development

In addition to the trees which will necessitate removal, the RPA of T3 will be encroached upon by a proposed pedestrian walkway by approximately 17%.

Retention of the T3 is considered feasible, provided that the any hardstanding within the RPA is constructed using minimal excavations, and upon a cellular confinement system.

5. Recommendations

5.1. Tree Works

Prior to works commencing, T1, T2, T5 and T6 will necessitate removal.

According to the website of Barnsley Metropolitan Borough Council (2019), none of the trees at the site are subject to Tree Preservation Orders (TPOs), nor are they located within the boundaries of a Conservation Area.

However, as the allocation of these can be liable to change, any legal delegations affecting trees should be checked and verified with Barnsley Metropolitan Borough Council prior to the commencement of works.

Killing or damaging a protected tree is a criminal offence and can result in an unlimited fine.

All tree works, including tree removals, should be carried out by a fully insured and suitably qualified arboricultural contractor who is able to comply with BS3998: 2010 – Tree Works: Recommendations.

5.2. Tree Protection

In order to ensure the successful retention of the retained trees on site, tree protection fencing should be installed as specified in **Appendix 5: Tree Protection Plan**.

A proposed pedestrian walkway within the RPA of T3, should be constructed upon a cellular confinement system. This will allow for adequate infiltration of water and free gaseous exchange between tree roots and the atmosphere.

In addition to the cellular confinement, the installation of any new sections of kerbstone and/or edging within the RPA of T3, should avoid trenching, and instead be constructed of a design which will minimise damage to tree roots (i.e. concrete pads with a 'floating' kerbstone laid across).

As the majority of tree roots are typically found within 1m of ground level, particular attention should also be paid to existing levels, and any further unavoidable excavations into the soil within the RPA of T3 should be carried out by use of hand-operated tools only.

It is recommended that works follow an Arboricultural Method Statement (AMS). An **AMS** can be viewed in **Appendix 4**. This includes further details regarding tree removals, along with specifications for tree protection fencing and cellular confinement.

As aspects of the development may be subject to change, the AMS should be reviewed by an arboricultural consultant prior to the commencement of works on the site.

5.3. Mitigation

The development proposals will necessitate the removal of four Category C tree of low-quality.

Although the proposed tree removals are anticipated to have minimal impact upon the amenity of the surrounding area, a post-development planting scheme should be undertaken which will help mitigate for the loss of trees at the site.

A minimum of four trees should therefore be planted at the site; these should be selected with the intention to diversify species structure at the site, with native trees often providing the greatest ecological benefits.

To ensure the best possible chances of successful establishment, trees planted should ideally be standard in size and should be planted in accordance with BS845: 2014 – Trees: from Nursery to Independence in the Landscape.

All trees should be affixed with a wooden stake, secured to the tree by a biodegradable cable tie. An organic woodchip mulch should be applied in a 1m radius around tree stems.

Suggested species include:

- Hornbeam *Carpinus betulus*
- Silver birch *Betula pendula*
- Sessile oak Quercus petraea
- Common alder *Alnus glutinosa*
- Wild service tree *Sorbus torminalis*
- Hawthorn *Crataegus monogyna*

In the interests of biosecurity, trees should be sourced from a UK based nursery. Trees should ideally be grown from seed within the UK, or if this is not possible to source, should have been grown on in the UK for at least one year after import.

6. References

Barnsley Metropolitan Borough Council (2019) *Interactive Mapping Service* [online]. Available at: >www.barnsley.gov.uk< [accessed 20th September 2019]

British Standards (2010). BS3998: 2010 – Tree Works: Recommendations. British Standards Institute, London

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Google Earth Pro (2019). *Google Earth* [online]. Available at: >www.google.co.uk/earth< [accessed 20th September 2019]

Johnson, O., More, D. (2004). *Collins Tree Guide.* London: HarperCollins

Mattheck, C., Bethge, K., and Weber, K. (2015). *The Body Language of Trees.* The Karlsruhe Research Institute, Karlsruhe (Germany)

Appendices

Appendix 1: Survey Schedule

A plan of the tree locations can be viewed in **Appendix 3: Tree Constraints Plan**.

Key			
Species	Common name following Johnson & More (2004)	Age	Early mature; tree in 2/3 of estimated lifespan
Height	Measured to nearest 0.5m		Mature; tree in 3/3 of estimated lifespan
CC	Height of crown clearance, measured to nearest 0.5m		Over mature; tree that has exceeded its natural life span
Stems	Number of stems bifurcating below 1.5 metres		Veteran tree
DBH	Diameter at breast height (1.5m), in centimetres	SULE	Safe useful life expectancy of tree, in years
Crown spread	Measured to nearest 0.5m	Category	See BS5837 cascade chart (Table 1)
Age	Young sapling/newly planted tree	#	Denotes estimated value
	Semi-mature; tree in 1/3 of estimated lifespan		

Individual Trees

Tree No.	Species	Height	CC	Stems	DBH	Crown Spread				Age	Comments	SULE	Category
						N	E	S	W				
T1	Goat willow *Salix caprea*	9.5	1.5	4	56 43 46 40	6	6	0	6	Mature	Situated on site boundary. Bifurcates into multiple co-dominant leaders at 0.5m. Limited arboricultural merit.	11-20	C1
T2	Goat willow *Salix caprea*	12	1.5	4	48 47 33 37	5.5	7	6	6	Mature	Situated on site boundary. Bifurcates into multiple leaders at ground level. Limited arboricultural merit.	11-20	C1

Tree No.	Species	Height	CC	Stems	DBH	Crown Spread				Age	Comments	SULE	Category
						N	E	S	W				
T3	Golden weeping willow *Salix × sepulcralis 'Chrysocoma'*	12	0	1	79	8	8	9	10	Mature	Pruning wound on south aspect of main stem at 1.5m, and at 3m, approximately 20cm in diameter, with evidence of decay. Bifurcates into three primary stems at 3.5m. Minor deadwood throughout crown.	21-40	B1
T4	Golden weeping willow *Salix × sepulcralis 'Chrysocoma'*	12	0	1	80	9.5	10	10	10	Mature	Multiple pruning wounds within lower portion of crown from previous crown raising works- most of which display poor occlusion. Minor deadwood throughout crown. Main stem leans somewhat to north-east.	21-40	B1
T5	Sycamore *Acer pseudoplatanus*	11.5	2.5	1	27	3	4	3	3	Semi-mature	Self -seeded tree of limited arboricultural merit. Situated in close proximity to existing building.	11-20	C1
T6	Sycamore *Acer pseudoplatanus*	9	2.5	2	10 15 18	3.5	5	4	3.5	Semi-mature	Self -seeded tree of limited arboricultural merit. Bifurcates into three primary stems at ground level. Situated in close proximity to existing building.	11-20	C1

Groups of Trees

Group No.	Species	Av. Height	Av. CC	Approx. Stems	Av. DBH	Av. Crown Spread	Av. Age	Comments	SULE	Category
G1	Apple *Malus domestica*, cotoneaster *Cotoneaster frigidus*, dogwood *Cornus sanguinea*, laburnum *Laburnum anagyroides*, sycamore *Acer pseudoplatanus*, hawthorn *Crataegus monogyna*, cherry laurel *Prunus laurocerasus*	4	0	40	5	2	Young	Linear group of low-quality trees and mixed shrubs situated on site boundary. Effective visual barrier, though of limited arboricultural merit.	11-20	C1

Appendix 2: Images of Trees



Plate 1: T1



Plate 2: T2



Plate 3: T4



Plate 4: T5



Plate 5: T4



Plate 6: T5



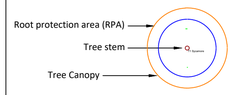
Plate 7: G1



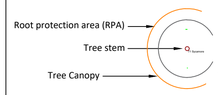
Appendix 3: Tree Constraints Plan

Key:

Category B trees of moderate-quality



Category C groups/trees of low-quality



Trees recommended for removal marked with dashed line

Existing Building Footprint

For further details regarding tree categoriation and root protection areas, refer to Arboricultural Impact Assessment report.

NORTH

Project:	Barnsley Fire Station
Drawing number:	TCP113401
Drawn by:	Jack Delaney
Date:	20th September 2019
Scale:	1:300 @ A1

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Bagshaw Ecology

Appendix 4: Arboricultural Method Statement

1. Introduction

Bagshaw Ecology Ltd have been instructed by Turner & Townsend Project Management to produce an Arboricultural Method Statement in relation to a proposed development of the land adjacent to Barnsley Fire Station, Broadway, Barnsley, S70 6QZ.

This document should be read in accordance with the Arboricultural Impact Assessment produced for the site.

The development proposals are to demolish the existing building, and construct a new fire station at the site.

2. Timing of Works

The phasing of works should be carried out in accordance with Tab. 1, below.

Table 1. Timing of Works

Stage	Works
1	Site induction
2	Carry out tree removals
3	Install temporary tree protection fencing
4	Carry out construction works (including installation of cellular confinement – as specified in **Appendix 5: Tree Protection Plan**)
5	Remove tree protection fencing once works completed
6	Final inspection by arboricultural consultant

3. Site Induction

Prior to works commencing, all contractors should attend a site induction. All contractors should be briefed on arboricultural concerns arising from the development proposals, including tree root protection areas (RPAs). This method statement should be issued to all contractors on the site.

4. Tree Removals

Prior to works commencing, T1, T2, T5 and T6 will necessitate removal.

According to the website of Barnsley Metropolitan Borough Council (2019), none of the trees at the site are subject to Tree Preservation Orders (TPOs), nor are they located within the boundaries of a Conservation Area.

However, as the allocation of these can be liable to change, any legal delegations affecting trees should be checked and verified with Barnsley Metropolitan Borough Council prior to the commencement of works.

Killing or damaging a protected tree is a criminal offence and can result in an unlimited fine.

All tree works, including tree removals, should be carried out by a fully insured and suitably qualified arboricultural contractor who is able to comply with BS3998: 2010 – Tree Works: Recommendations.

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5. Tree Protection Fencing

Prior to machinery entering the site, it will be necessary to ensure that all trees are adequately protected. This will require the installation of temporary of tree protection fencing on the site between the building and adjacent trees.

Tree protection fencing should consist of a vertical scaffold framework, well braced to resist impacts. The vertical poles should be spaced at a maximum interval of 3m and driven securely into the ground. Onto this framework, welded mesh panels should be fixed (see figure 1, below).

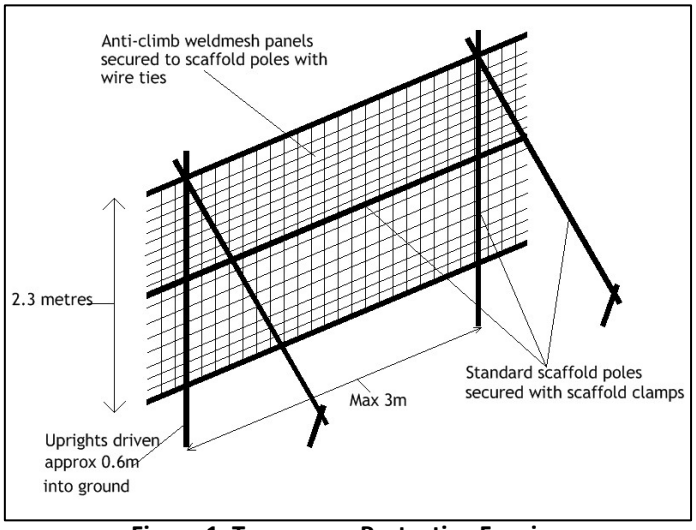


Figure 1. Temporary Protective Fencing

Laminated waterproof A3 signs should be fixed securely to fencing panels on each enclosure at 9m intervals. The signs should clearly read: ***'Protected Tree Zone, no storage or operations within fenced off areas'***.

Once the construction works have been completed, the tree protection fencing may be removed. This should be done with care to ensure that no damage to trees is caused.

6. Cellular Confinement System

The installation of the cellular confinement system should be undertaken in all areas where a proposed pedestrian walkway passes over the RPA of T3.

Cellular confinement should be installed in the following stages:

1. Level ground with hand tools only. No pruning of roots should be undertaken without notifying a consultant arboriculturist. Any vegetation removal may be carried out with a translocate herbicide (such as glyphosate).
2. Cover surface with a non-woven, geotextile separation filtration layer.
3. Install cellular confinement sheets.
4. Place 40/20mm clean angular stone into open cells.
5. Cover with second non-woven geotextile separation filtration layer
6. Install 75mm porous asphalt, or 60mm decorative gravel.

The extent of the proposed cellular confinement system can be viewed in **Appendix 5: Tree Protection Plan.**

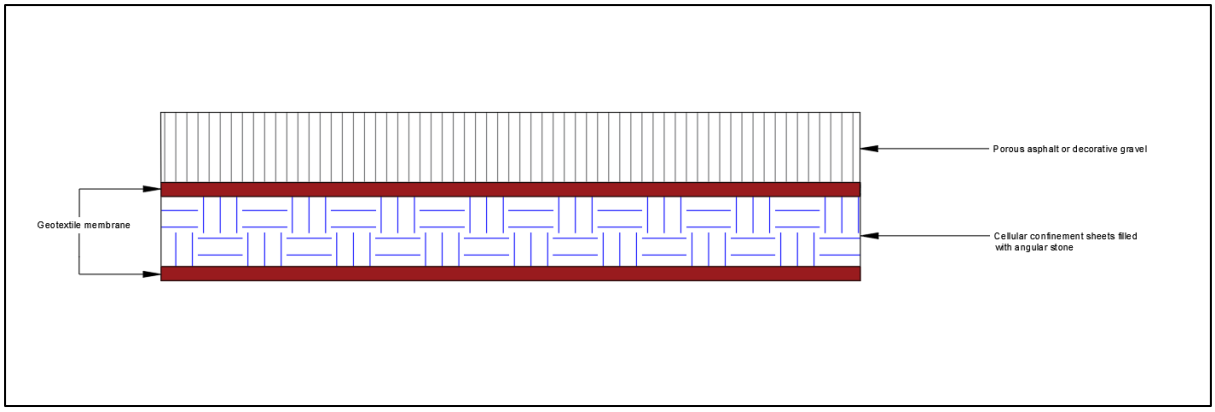


Figure 2. Cellular confinement construction

As the majority of tree roots are typically found within 1m of ground level, particular attention should be paid to existing levels, and any unavoidable excavations into the soil should be carried out by use of hand operated tools only.

In addition to the cellular confinement, the installation of sections of kerbstone within the RPA of T3 should avoid trenching, and instead be constructed of a design which will minimise damage to tree roots (i.e. concrete pads with a 'floating' kerbstone laid across).

7. Precautionary Measures

No materials hazardous to tree health, such as oil, bitumen or cement should be stored within the protective fencing. Where possible this area should be extended to 10m away from the fencing.

Where there is a risk of polluted water runoff into RPAs, heavy duty plastic sheeting and sandbags must be used to contain any spillages and prevent contamination.

No fires should be lit within 20 metres of the protective fencing.

If any breach in the tree protection measures occurs it is the site manager's responsibility to report this to an arboricultural consultant so the appropriate measures may be taken. Any breach in the tree protection resulting in the death of or damage to trees could result in a criminal offence being committed.

8. Supervised works and further inspection

It is recommended that inspections by an arboricultural consultant are undertaken:

- Once the tree protection fencing has been installed to determine if it is satisfactory.
- Upon completion of the development works.

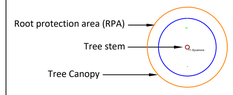
After each inspection a letter should be submitted by the arboricultural consultant to the local authority tree officer to confirm if the method statement has been followed correctly and if trees have not been adversely affected by construction works.



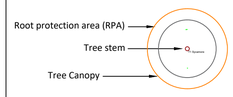
Appendix 5: Tree Protection Plan

Key:

Category B trees of moderate-quality



Category C groups/trees of low-quality



Tree Protection Fencing

Cellular Confinement

For further details regarding tree categoriation and root protection areas, refer to Arboricultural Impact Assessment report.

NORTH

Project:	Barnsley Fire Station
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